COMPARATIVE ANALYSIS OF ENAMEL BOND STRENGTH ANDMICROLEAKAGE OF 5TH AND 7TH GENERATION BONDING AGENTS ON CUT AND UNCUT ENAMEL SURFACES

A

Synopsis

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Declaration

I hereby affirm the work "**COMPARATIVE ANALYSIS OF ENAMEL BOND STRENGTH ANDMICROLEAKAGE OF 5TH AND 7TH GENERATION BONDING AGENTS ON CUT AND UNCUT ENAMEL SURFACES**" Presented in this synopsis is exclusively my own work and there are no collaborations. It does not contain any work for which a degree has been awarded by any other university institution. All ideas and references have been duly acknowledged.

Dated: 19 September 2022

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INTRODUCTION

The fundamentals of adhesive dentistry were first proposed by Buonocore in 1955, who used industrial bonding methods to argue that acids can be exploited in surface treatment prior to the application of resins.[1] He subsequently discovered that phosphoric acid etching of enamel lengthened adhesion under water.[2] The fundamental idea behind bonding to dental matrix is an exchange process in which synthetic resin is used to replace the inorganic tooth material.[3] Although bonding to enamel could be accomplished successfully, bonding to dentin was extremely difficult because of its heterogeneous makeup and water content. Smear layers and smear plugs were present, and this posed a serious issue becausethey prevented the dentin bonding agent from making direct contact with the tooth surface.We now have bonding systems that can provide expected and stable joining to both enamel and dentin with simple to use methods after going through a number of generational advancements and overcoming early setbacks. One of dentistry's most important developments in the 20th and 21st centuries was enamel bonding which plays a significant role in most of the restorative procedures. They involve placing braces, gluing ceramic veneers to etched enamel, extending class V restorations over beveled coating surfaces, filling gaps with resin-based composites, and applying sealants.[4] Most of the times, the difference in bond strength between one bottle systems

and self-etching primer remains comparable. Leakage tests performed in the lab and in real-world settings have demonstrated that one-bottle systems produce a better seal at the enamel margins than self-etching primer.[5,6] Sadly, despite the bonding products' simplification, worries about enamel bonds, substrate variability, and technique sensitivityhave grown. A dissertation component, this study compares the performance of the newer,simpler 7th generation bonding system (i-Bond) to the 5th generation bonding system (Single Bond) on cut and uncut enamel surfaces.

Aims & Objectives

This study will be designed to compare the 5th and 7th generation bonding agents vis a vis tensile bond strength on cut and uncut enamel surfaces and micro leakage in class V cavities prepared in enamel.

Review of Literature

A simplistic approach of improving the bond between acrylic filling materials and enamel surfaces was introduced by Michael Buonocore, who is regarded as the father of adhesive dentistry, in a paper published in 1955. 85% phosphoric acid was used by him to treat the enamel.[1]The adhesive acrylic resin material could bond to the detached teeth's dentin surface, and it was demonstrated in a study looking into the possibility of resin bonding to enamel that linkage or bonding potency could be roughly doubled with the help acid etching the dentinal surface. The connection was created by a chemical reaction between a part of the adhesive system and the organic dentin substance. The resin was dimethaacrylate monomer with which phosphate groups were linked.[2] In a study on the connection between the achieved bond strength and the etch patterns caused

by phosphoric acid on surface enamel. There was no discernible differences between the etch types on the lower and upper teeth. Albeit, the individual's teeth in the lower and upper arches did, however, statistically differ significantly from one another. They came to the conclusion that even without the perfect etch pattern, a strong bond could still be produced.[7] Along with examining the effectiveness of enamel etchants less potent than 10% phosphoric acid, researchers also looked at the relationship between the penetration depth and TBS(total bond strength) of a photo-cured resin to enamel that has been etched with phosphoric acid. They discovered that the length of the tags made by the tested photo-cured resin on enamel that had been etched with phosphoric acid had little to no impact on the binding effectiveness of test specimens. Any potential harm to enamel substrates might be reduced by using less aggressive acid concentrations.[8] A study looked into whether traditional mid-grit diamond bur and 600 grit Si C paper preparation techniques, which were used as controls, generate comparable enamel/dentine surfaces that are as amenable to bonding as various surface treatments such as diamond sono-abrasion, air-abrasion, and Er: exposure to YAG laser energy. It was established that employing an etch-and- rinse adhesive still requires separate acid etching of enamel and dentin surfaces that have been air-abraded and exposed to Er: YAG laser radiation. Dentin and enamel surfaces' bonding prepared by diamond sono abrading and air abrading was generally similar to bonding to surfaces prepared by conventional diamond burs, whereas bonding to surfaces prepared by Er: YAG laser irradiation generally resulted in a significantly lower bonding effectiveness than surfaces prepared by diamond burs.[9] In a study, (μ TBS) of one-bottle adhesive systems based on ethanol/water and acetone to enamel and dentin was examined

in the presence and absence of the corresponding solvents. The mean bond strength between the groups restored with and without an enamel solvent did not differ statistically significantly between them, it was noted. The lack of solvents in the adhesive systems, however, had a considerable impact on the microtensille bond potency (μ TBS) to dentin.[10]A research investigated the assertions that the resin-enamel bond strength varies by location and that the relationship between the bond potency and affixed cross- sectional area is inverse? These adhesive systems included Scotch bond Multipurpose and Clearfil Liner Bond II. The highest bond strength measurements of binding strength in the occlusal third were much greater than those to cervical enamel. This is most likely because fewer interfacial stress raisers are used in smaller samples.[11]Through shear bond strength and micro leakage; a study compared the efficacy of two acidic primers for bonding to enamel and dentin with and without etching. Maleic acid was present in one of the acidic primers while Phenyl-P was present in the other. It was discovered that the acidic primer containing Phenyl-P could be applied to enamel and dentin without the need for an etching step,but the primer containing maleic acid needed to be applied with an etching step.[12]An overview of the parts and polymer chemistry features of the self- etching enamel-dentin adhesives now in use. Additionally, the improvement in single bottle adhesive performance brought on by novel adhesive's monomers and traverse linkers with greater hydrolytic moisten stability over methacrylate is examined. It was determined that more reliable andsuitable components must be produced in the future. Utilizing contemporary acrylic ether phosphate acids or mono- or difunctional

acrylamides will boost the durability of self-etching enamel-dentin adhesives.[13]

When N-acryloyl aspartic acid concentration reached 20 wt%, the binding tensile vigor to enamel grew linearly with increasing the acid intensity, reaching the equivalent value of 40 wt% as with enamel etched phosphoric acid with the benefit of skipping the rinse step with water.[14] In a study to evaluate the enamel microtensile bonding power of five couples of enamel adhesives from the same manufacturer, it was found that some total-etch adhesives performs excellently well in connecting to enamel as compared with equivalent self-etch adhesives. The use of a diamond bur to roughen enamel sparked a trend for self-etch adhesives with a stronger adhesion.[15]

Material and methods:

- Six sets of 60 extracted human mandibular molars will be chosen at random. Two groups each will be bonded using 5th and 7th generation adhering agents on cut/uncut enamel surfaces, and four groups total will be employed for the TBS investigation. Class V cavities that have been constructed on buccal surfaces will be repaired using 5th or 7th generationbonding agents to conduct a microleakage investigation. The apices of the teeth should be sealed **with Glass ionomer cement to** avoid dye penetration from the root canal.
- Teeth will be sectioned bucco-lingually in to mesial and distal halves using lathe mounted carborundum discs. Mesial and distal sections of one tooth will be considered similar. **So both mesial and distal section will viewed under stereomicroscope** with 40x magnification and microleakage was scored depending on the degree of dye penetration.

The recovered teeth will undergo a 100-cycle thermocycle between 0°C and 550°C at

37°C and 100% humidity for24 hours. Universal testing equipment will be used to assess the tensile bond strength, anda stereomicroscope will be used to measure the amount of microleakage.

Statistical Analysis

For quantitative data, the mean, SD, SEM, and range values will be shown. For comparisons between more than one group, a one-way analysis of variance will be employed, supervened by a pairwise comparison using an unpaired t-test. Mann-whitney test will be utilised to determine any significant difference between the two groups since micro leakage will be evaluated using scores, a non-parametric approach. A "p" value of 0.05 or less will be used for each test to indicate statistical significance.

test will be utilised to determine any significant difference between the two groups sincemicro leakage will be evaluated using scores, a non-parametric approach. A "p" value of 0.06 or less will be used for each test to indicate statistical significance.

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